

Computers and Internet
CQ Magazine, June 2001
Don Rotolo, N2IRZ

As Hams, many of us are interested in technology. Are you the type who, as soon as that new piece of equipment gets home, takes it apart to see what's inside before even powering it up? Join the club. Even if you're not, this month's column is for you, as we explore the guts of a modern Personal Computer.

First, we'll look at all the various parts, with an emphasis on selecting the type that's right for you. Then, we'll talk about putting them all together. Yes, I mean assembling your own computer from the major parts!

My primary goal is to ease your fears: The insides of a computer are not nearly as complicated as you might think. Really, we have a half-dozen or so building blocks, which are all joined together with fool-resistant connectors. If you can read and use a screwdriver, you can assemble a Personal Computer (PC) yourself. Let's have a look at the major building blocks:

We're On The Case

The first item to consider is the case, or cabinet everything is housed in. Newer PCs use "Type ATX" cases, which are physically and electrically different from the older "Type AT" cases. Although your choice of motherboard and power supply will depend upon the case type, for a new PC, ATX is the only real choice. Most cases come with a power supply, get one rated for at least 200 watts. Select the size that fits at least the number of drives you want - at least three in any case. Cheap cases are spot-welded together, have sharp edges inside, and are made of thinner metal. Premium cases have nice features like slide-out motherboard carriers, so you can work on the innards without having to remove any of the option cards. If you plan on working inside the PC often, get a better case.

Processor & Motherboard

The next consideration is the motherboard and processor combination, the heart of the system. Make no mistake, the performance of the processor is highly dependent upon which motherboard is being used. Your best bet is to research your choices online (see Resources), or in one of the trade magazines such as *Computer Shopper*. When choosing a motherboard, look for higher bus speeds (100 or 133 MHz) and at least 256 kB on-board Level 2 (L2) cache. Also, check out how many ISA and PCI slots it supports (count up your adapter cards, and consider future expansion). Insist on an AGP slot: This slot is used for the video adapter card, and the performance improvement gained over a PCI slot video adapter is considerable.

Your choice of processor is not nearly as critical as your choice of motherboard. Some prefer the well-known Intel processors, but lately both AMD and Cyrix have been producing processors

that are superior to the Intel processor of the same clock speed. Verify that the processor and motherboard are compatible - chip socket type, voltage and speed are key factors. The best way to avoid problems is to buy the motherboard and processor at the same time, and have them configure the jumpers for you. Get a good cooling fan for the processor, too.

With a processor (Central Processing Unit, or CPU), don't waste your money on the very latest and greatest, since the increase in performance as compared to what's more reasonably priced is not that great. For example, a 1 GHz Pentium 4 is available for \$1,300 as I write this, but a better buy might be the 733 MHz Pentium III for \$245. Don't be fooled into thinking that the 1.42 times faster processor offers 1.42 times the performance - it doesn't, even though the price is more than five times (!) greater than the slower chip's.

Remember the Memory

Buying memory is very simple. Consider the memory form factor and speed your motherboard uses, then buy as much as you can afford, with 64 MB being the absolute minimum, and 128 MB strongly suggested. Any less, and performance will surely suffer with any modern software.

Drives: Hard, CD and Floppy

Hard drive selection is also simple. Stick to IDE drives, unless you understand and really need a SCSI drive. Enormous IDE drives are available for a pittance. 20 GB is a typical size, costing just over \$100, and this should be plenty for a while. Buy something big enough, but remember you can buy another one later if you run out of space. The important factors to consider are the disk speed (in RPMs) and access time, both of which influence performance, with higher RPMs and lower access times being better (and more expensive).

These days, CD-ROM drives slower than 20x are hard to find, and cost a few tens of dollars. Nearly all software comes on CD these days, so you definitely need one. Consider an upgrade to a CD reader/recorder (CD-R or CD-RW), so you can archive data or record your own music CDs. A CD-R drive can write once onto a recordable CD, but the CD cannot be erased and re-written. A CD-RW drive can write onto a special re-recordable CD, and erase and re-write, much like a floppy. These are a better choice, at under \$150. You can also get a CD drive that plays DVDs - useful if you are into games or DVD videos. For videos, you'll have to view them on your computer, unless your video adapter has a Video Output connection.

You should probably get a floppy drive. A 3 1/2 inch 1.44 MB floppy drive costs about \$20, and can come in handy for sharing data with others. This also provides backwards compatibility for older software, and simplifies making an emergency start-up (boot) disk.

It's in the Cards

Now we need to consider the adapter cards. Most motherboards come with the IDE Hard Disk Drive (HDD) and Floppy Disk Drive (FDD) circuitry on board, as well as the standard 2 serial ports, one parallel port, and one Game port. USB ports are also handy, but only if you're running Windows 98 or higher. That leaves only the Modem, Sound card, and the Video adapter, and perhaps some specialized cards.

These days, a 56kb telephone modem costs less than a case, so buying anything less is ill-advised. I suggest an Internal modem, although an External modem is not much more expensive, and can be much more versatile. Most modems today include Fax and Voicemail capabilities. You might omit this item if you have a cable, ISDN or DSL modem.

With sound cards, I haven't found much differences among them. I tend to stick with name brands, for their better support and compatibility, especially with many Amateur Radio programs. If you anticipate using the MIDI capabilities of the sound card, get one with a larger number of 'voices' or instrument simulations. If you get a sound card, don't forget some speakers, and perhaps one of those headset microphones.

Video adapter cards come in myriad styles and prices. I suggest simply picking one that had the features you need - AGP slot support, a certain screen resolution (e.g. 1024 x 768), perhaps a Video Output (or Input!) jack - and then looking for a reasonable price. The amount of memory on the video card does not influence performance much, it has a greater effect upon the number of colors that can be displayed at higher resolutions. Some video cards are optimized for business use - displaying spreadsheets and charts - and some are optimized for high-performance games.

As we discussed in the March 2001 issue, one adapter card you might consider is an Ethernet NIC (Network Interface Card). You can connect all your computers together and share resources such as hard disks and printers. If you have Windows 3.11 or later, networking is included with the operating system. I recommend 10/100BASE-T types, which can be had for under \$30.

Accessorize!

Lastly are the accessories - keyboard, monitor, mouse, maybe a printer or ZIP drive. Your selection depends heavily upon your personal preferences, your available cash, and what you already have. I like my Microsoft Internet Keyboard and Logitech Scroll Mouse, both of which make web browsing a lot more convenient and have the right 'feel' for me. With monitors, you'd be insane to get one smaller than 17" or with a dot pitch greater than 0.28 - your eyes will thank you. Avoid flat LCD monitors, because of their relatively large pixel size - at the very least, look at one before you make a decision to spend all that money.

If you're really planning on putting one of these together, do your research first. Check out the Resources listed below, talk to people who know a little about PCs, go to a local computer show (much like a hamfest) or small PC shop and ask them any questions you might have. I advise staying away from the large computer stores, as they specialize in assembled systems. Open the

PC you have now, and see how it all fits together. Maybe stop at the bookstore and buy a book on the subject - there are many.

With this information and our overview of all the parts in mind, make some tentative selections for each item, and write down the brand, model and price for each vendor. If it's still too expensive, make some compromises, or wait a month for prices to fall some more. Read the on-line reviews of each item. Finally, pick a day, compare prices on what you want to buy, and get each part from the vendor with the lowest price. Or, go online and find the best mail-order vendor. (Remember shipping charges!). Get it all home, assemble it, load the software, and have fun!

As usual, if you have any questions, don't hesitate to write. In September, we'll explore the world of Data Acquisition, how it's being used in the world of Amateur Radio, and how you can get involved. Until then, 73 - N2IRZ

Resources

Tom's Hardware Guide <<http://www.tomshardware.com/>> has lots of information about hardware, including reviews and tests. This is the site I use when researching hardware of all types, and finding the lowest on-line price. Lots of PC Industry news and original content.

Planet Hardware <<http://www.planethardware.com/>> is another site devoted to helping you select hardware, with reviews and recommendations. Be sure to check out their do-it-yourself guides.

The Rockville Living Computer Guy's guide to building your own PC <<http://www.rockvilleliving.com/cg990610.html>> offers detailed advice on selecting components and assembling them into a working computer. Slightly outdated, but valuable nonetheless.

Motherboard Homeworld Guides <<http://www.motherboards.org/guides.html>> are detailed guides to selecting components and building your own computer. Motherboards are a specialty.

PC Mechanic's 'Build Your Own' Guides <<http://www.pcmech.com/build.htm>> include a detailed guide to assembling a computer, as well as building a server or a home network. On this latter topic, be sure to read Computers & Internet in the March 2001 issue of *CQ*.

Photo captions

Photo 1: Whether the latest Pentium 4 or the old '386 seen here, the basic architecture of a computer has not changed much since the early 90s. Here we see each of the major parts of a

desktop system, essentially the same as the newest systems being built today. The main difference is a lower level of integration on the motherboard. Note the 16-bit ISA slots and soldered-in CPU

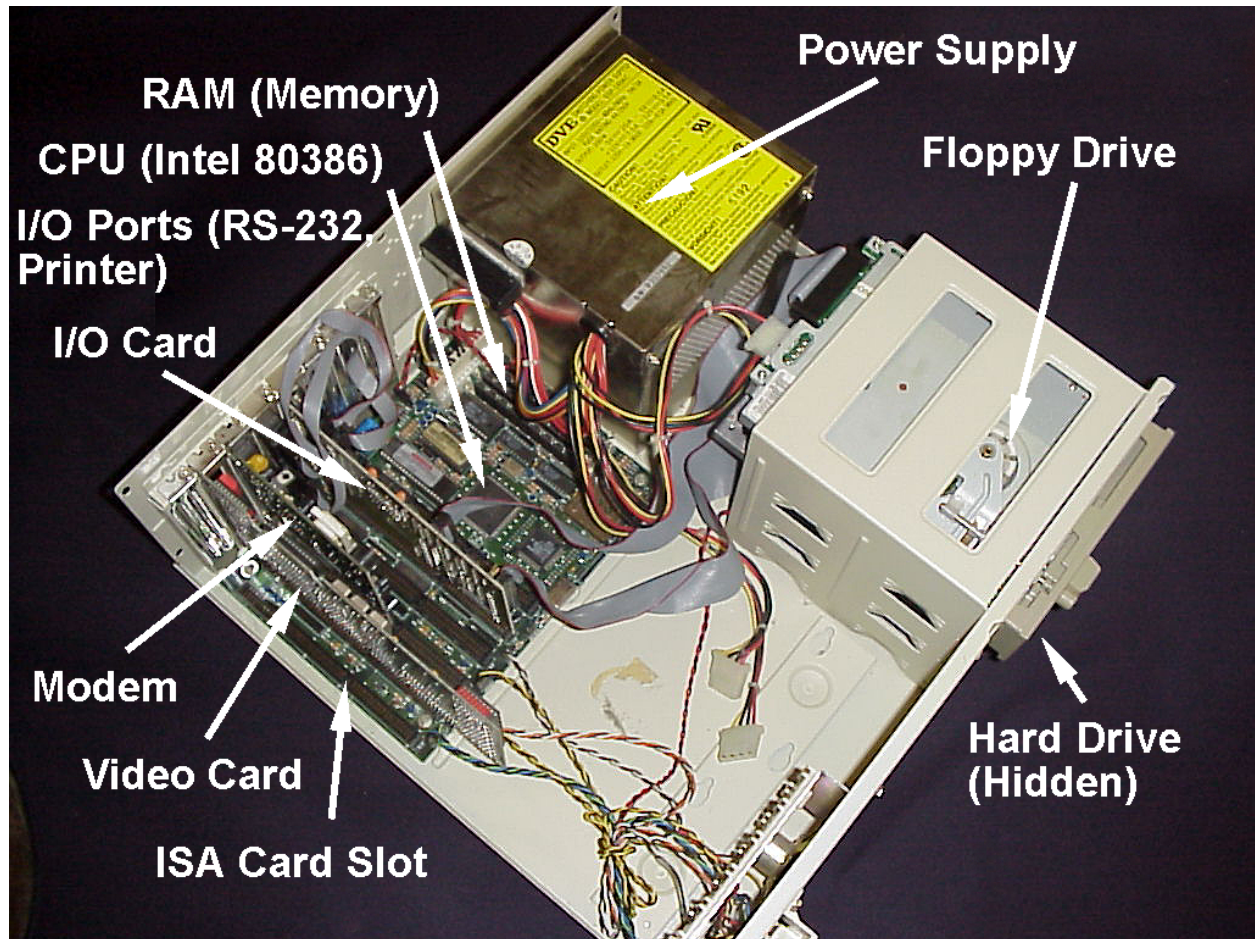


Photo 2: A 100 MHz Pentium, which is considered obsolete, in a mid-tower case. This system works just fine under Windows 3.11, and is used as a printer server. This was one hot machine ten years ago. This motherboard sports both ISA and PCI slots.

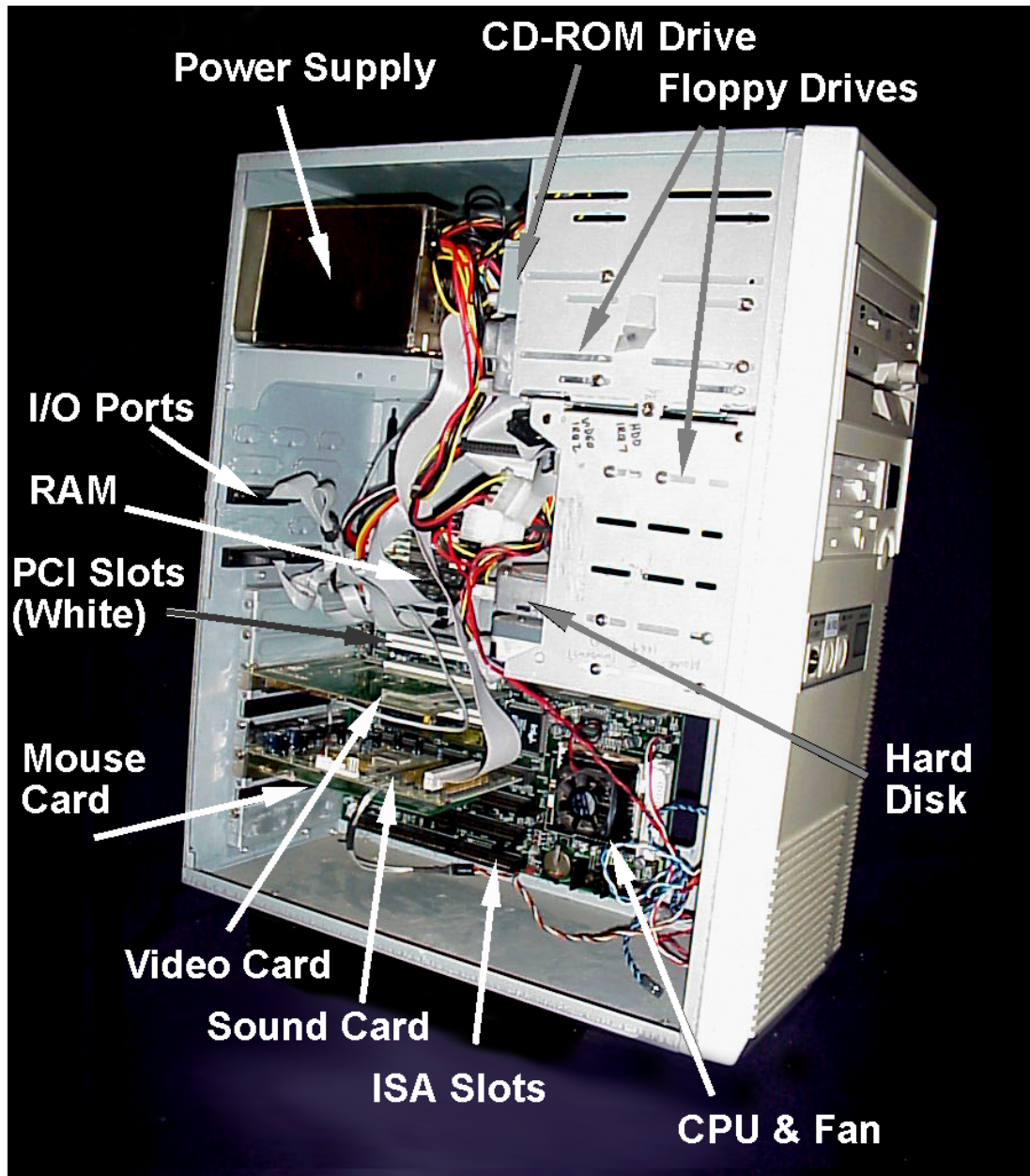


Photo 3: A positively ancient Zenith Z158, running DOS 6.22 on a 6 MHz 8088 processor and sports 640 k of RAM and a 20 MB hard drive. Yes, 20 MB, about 14 floppies' worth. I use this computer for all my packet work. Note that computers of this vintage are not modular like modern PCs - those two large 'cards' in the center are the CPU and Memory boards, and there's a disk controller, as well as video, mouse and I/O cards. All these cards are interconnected with a passive backplane. Note that all the chips are socketed! This beast cost over \$3500 in 1985.

